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Seas, Flaws, and contrary Blasts; and 'tis well if by many cross Tacks and Veerings you arrive at the Port; for we sleep in Lyons Skins in our Progress unto Virtue and we slide not, but climb unto it."

Have a purpose and carry it out with fortitude. There can be no more absorbing or inspiring career than is afforded by the study of medicine at the present time. The scaffolding reared by countless workers during thousands of years around the fair temple of medicine, necessary for the building doubtless, but concealing its proportions and too often defacing its beauties, has been swept away and for the first time it is permitted to us to know something of the dimensions and architectural possibilities of the completed edifice. Can there be a nobler aspiration for any man than to assist in the completion of the work of transforming the ancient art of healing into the science of medicine?

In my childhood in a far distant state I daily heard from the lips of an aged relative the story of Yale College and New Haven as she had known them at the beginning of the last century. Her tales of the many scholarly activities of the first President Dwight, of the scientific zeal and achievements of the elder Silliman, of the boundless industry in many fields of Noah Webster and of the profound learning and influence of Dr. Æneas Munson, presented ideals of life and possibilities of scholarly attainment which have remained with me ever since. Those who have been engaged in educational work here during the past two centuries can have had no conception of the silent influence which Yale has exerted upon the training of generation after generation of men throughout the whole land who have never visited New Haven nor come into personal contact with the eminent teachers who have gathered here.

Mindful of my own indebtedness to

Yale, wholly indirect, I am not guilty of overstatement when I say that I regard the honor of an invitation to address you to-day as the most cherished academic event of my life. I regard the honor, however, in no sense a personal one, but deem it rather an evidence of the good will and amity which has ever characterized the relations between Yale and other schools and teachers. The university with which I am connected and which in a sense I represent to-day is equally her debtor for scholarly inspiration and example, and in her name as well as my own I would render most grateful and appreciative acknowledgment.

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*THE NEW DEFINITION OF THE CULTIVATED MAN.\**

THE ideal of general cultivation has been one of the standards in education. It is the object of this paper to show that the idea of cultivation in the highly trained human being has undergone substantial changes during the nineteenth century.

I propose to use the term cultivated man in only its good sense—in Emerson's sense. In this paper he is not to be a weak, critical, fastidious creature, vain of a little exclusive information or of an uncommon knack in Latin verse or mathematical logic; he is to be a man of quick perceptions, broad sympathies and wide affinities, responsive but independent, self-reliant but deferential, loving truth and candor but also moderation and proportion, courageous but gentle, not finished but perfecting.

There are two principal differences between the present ideal and that which prevailed at the beginning of the nineteenth century. The horizon of the human intel-

\* From the presidential address of Dr. Charles W. Eliot, before the National Educational Association.

lect has widened wonderfully during the past one hundred years, and the scientific method of inquiry has been the means of that widening. The most convinced exponents and advocates of humanism now recognize that science is the 'paramount force of the modern as distinguished from the antique and the mediæval spirit' (John Addington Symonds—'Culture'), and that 'an interpenetration of humanism with science and of science with humanism is the condition of the highest culture.'

Emerson taught that the acquisition of some form of manual skill and the practice of some form of manual labor were essential elements of culture, and this idea has more and more become accepted in the systematic education of youth.

The idea of some sort of bodily excellence was, to be sure, not absent in the old conception of the cultivated man. The gentleman could ride well, dance gracefully and fence with skill, but the modern conception of bodily skill as an element in cultivation is more comprehensive, and includes that habitual contact with the external world which Emerson deemed essential to real culture.

We have become convinced that some intimate, sympathetic acquaintance with the natural objects of the earth and sky adds greatly to the happiness of life, and that this acquaintance should be begun in childhood and be developed all through adolescence and maturity. A brook, a hedge-row or a garden is an inexhaustible teacher of wonder, reverence and love.

The scientists insist to-day on nature study for children, but we teachers ought long ago to have learnt from the poets the value of this element in education. The idea of culture has always included a quick and wide sympathy with men; it should hereafter include sympathy with nature, and particularly with its living forms, a

sympathy based on some accurate observation of nature.

We proceed to examine four elements of culture:

**Character.** The moral sense of the modern world makes character a more important element than it used to be in the ideal of a cultivated man. Now character is formed, as Goethe said, in the 'stream of the world,' not in stillness, or isolation, but in the quick moving tides of the busy world, the world of nature and the world of mankind. To the old idea of culture some knowledge of history was indispensable.

Now, history is a representation of the stream of the world, or of some little portion of that stream, 100, 500, 2,000 years ago. Acquaintance with some part of the present stream ought to be more formative of character, and more instructive as regards external nature and the nature of man, than any partial survey of the stream that was flowing centuries ago.

The rising generation should think hard and feel keenly, just where the men and women who constitute the actual human world are thinking and feeling most to-day. The panorama of to-day's events is an invaluable and a new means of developing good judgment, good feeling, and the passion for social service, or, in other words, of securing cultivation.

But some one will say the stream of the world is foul. True in part. The stream is what it has been, a mixture of foulness and purity, of meanness and majesty; but it has nourished individual virtue and race civilization. Literature and history are a similar mixture, and yet are the traditional means of culture. Are not the Greek tragedies means of culture? Yet they are full of incest, murder and human sacrifices to lustful and revengeful gods.

**Language.** A cultivated man should express himself by tongue or pen with some

accuracy and elegance; therefore linguistic training has had great importance in the idea of cultivation. The conditions of the educated world have, however, changed so profoundly since the revival of learning in Italy that our inherited ideas concerning training in language and literature have required large modifications.

In the year 1400 it might have been said with truth that there was but one language of the scholars, the Latin, and but two great literatures, the Hebrew and the Greek. Since that time, however, other great literatures have arisen, the Italian, Spanish, French, German, and, above all, the English, which has become incomparably the most extensive and various and the noblest of literatures.

Under these circumstances it is impossible to maintain that a knowledge of any particular literature is indispensable to culture. When we ask ourselves why a knowledge of literature seems indispensable to the ordinary idea of cultivation, we find no answer except this—that in literature are portrayed all human passions, desires and aspirations, and that acquaintance with these human feelings and with the means of portraying them seems to us essential to culture. The linguistic and literary element in cultivation therefore abides, but has become vastly broader than formerly, so broad, indeed, that selection among its various fields is forced upon every educated youth.

The store of knowledge. The next great element in cultivation to which I ask your attention is acquaintance with some parts of the store of knowledge which humanity in its progress from barbarism has acquired and laid up. This is the prodigious store of recorded, rationalized and systematized discoveries, experiences and ideas—the store which we teachers try to pass on to the rising generation.

The capacity to assimilate this store and

improve it in each successive generation is the distinction of the human race over other animals. It is too vast for any man to master, though he had a hundred lives instead of one; and its growth in the nineteenth century was greater than in all the thirty preceding centuries put together. In the eighteenth century a diligent student with strong memory and quick powers of apprehension need not have despaired of mastering a large fraction of this store of knowledge. Long before the end of the nineteenth century such a task had become impossible.

Culture, therefore, can no longer imply a knowledge of everything—not even a little knowledge of everything. It must be content with general knowledge of some things, and a real mastery of some small portion of the human store. Here is a profound modification of the idea of cultivation which the nineteenth century has brought about. What portion or portions of the infinite human store are most proper to the cultivated man? The answer must be—those which enable him, with his individual personal qualities, to deal best and sympathize best with nature and with other human beings.

It is here that the passion for service must fuse with the passion for knowledge. We have learned from nineteenth century experience that there is no field of real knowledge which may not suddenly prove contributory in a high degree to human happiness and the progress of civilization, and therefore acceptable as a worthy element in the truest culture.

Imagination. The only other element in cultivation which time will permit me to treat is the training of the constructive imagination. The imagination is the greatest of human powers, no matter in what field it works—in art or literature, in mechanical invention, in science, government, commerce or religion, and the

training of the imagination is, therefore, far the most important part of education.

I use the term constructive imagination, because that implies the creation or building of a new thing. The sculptor, for example, imagines or conceives the perfect form of a child ten years of age; he has never seen such a thing; for a child perfect in form is never produced; he has seen in different children the elements of perfection, here one and there another. In his imagination, he combines these elements of the perfect form, which he has only seen separated, and from this picture in his mind he carves the stone and in the execution invariably loses his ideal—that is, falls short of it or fails to express it.

Constructive imagination is the great power of the poet, as well as of the artist, and the nineteenth century has convinced us that it is also the great power of the man of science, the investigator and the natural philosopher. The educated world needs to recognize the new varieties of constructive imagination.

Zola, in '*La bête humaine*,' contrives that ten persons, all connected with the railroad from Paris to Havre, shall be either murderers or murdered, or both, within eighteen months; and he adds two railroad slaughters criminally procured. The conditions of time and place are ingeniously imagined, and no detail is omitted which can heighten the effect of this homicidal fiction.

Contrast this kind of constructive imagination with the kind which conceived the great wells sunk in the solid rock below Niagara that contain the turbines that drive the dynamos, that generate the electric force that turns thousands of wheels and lights thousands of lamps over hundreds of square miles of adjoining territory; or with the kind which conceives the sending of human thoughts across 3000 miles of stormy sea instantaneously on nothing more substantial than ethereal waves.

There is going to be room in the hearts of twentieth century men for a high admiration of these kinds of imagination as well as for that of the poet, artist or dramatist.

It is one lesson of the nineteenth century, then, that in every field of human knowledge the constructive imagination finds play—in literature, in history, in theology, in anthropology, and in the whole field of physical and biological research.

That great century has taught us that, on the whole, the scientific imagination is quite as productive for human service as the literary or poetic imagination. The imagination of Darwin or Pasteur, for example, is as high and productive a form of imagination as that of Dante, of Goethe, or even Shakespeare, if we regard the human uses which result from the exercise of imaginative powers, and mean by human uses not meat and drink, clothes and shelter, but the satisfaction of mental and spiritual needs.

It results from this brief survey that the elements and means of cultivation are much more numerous than they used to be; so that it is not wise to say of any one acquisition or faculty—with it cultivation becomes possible, without it impossible.

The one acquisition may be immense, and yet cultivation may not have been attained. We have met artists who were rude and uncouth, yet possessed a high degree of technical skill and strong powers of imagination. We have seen philanthropists and statesmen whose minds have played on great causes and great affairs, and yet who lacked an accurate use of their mother tongue, and had no historical perspective or background of historical knowledge. We must not expect systematic education to produce multitudes of highly cultivated and symmetrically developed persons; the multitudinous product will always be imperfect, just as there are no perfect trees, animals, flowers or crystals.

Let us as teachers accept no single element or variety of culture as the one essential; let us remember that the best fruits of real culture are an open mind, broad sympathies and respect for all the diverse achievements of the human intellect at whatever stage of development they may be to-day—the stage of fresh discovery, or bold exploration, or complete conquest. The moral elements of the new education are so strong that the new forms of culture are likely to prove themselves quite as productive of morality, high-mindedness and idealism as the old.

CHAS. W. ELIOT.

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SCIENTIFIC BOOKS.

*West Indian Madreporarian Polyps.* By J. E. DUERDEN. *Memoirs of the National Academy of Sciences*, Vol. VIII. 1902.

It may seem strange that notwithstanding the thorough study that has been devoted to the skeleton of the corals our knowledge of their soft parts has been exceedingly limited until recent years. It must be remembered, however, that interest in the anatomy of the nearly related Actiniaria was not really awakened until the publication of Richard Hertwig's report on the Challenger collection in 1882, and the technical difficulties in the way of extended anatomical study of the coral may well be advanced as an excuse for its neglect.

In the same year that Hertwig's report appeared, however, von Koch laid the foundation for a proper appreciation of the significance of the soft parts of the corals by demonstrating the ectodermal nature of the corallum, and since that date valuable contributions to the anatomy of the Madreporarian polyps have been made by von Koch himself and by Bourne, Fowler and von Heider. The total number of forms studied has, however, remained comparatively small, and although enough information was gained to demonstrate a close similarity of the Madrepores to the Hexactiniae, yet there was a lack of suffi-

cient data upon which general conclusions could be based. A systematic study of a large number of forms was needed, and this need has recently been supplied by Dr. J. E. Duerden in his paper on the West Indian corals, a paper destined to stand as a landmark in our knowledge of Madreporarian morphology equal in importance to that established by von Koch.

Duerden has made a thorough study of the morphology of no less than twenty-six species of corals belonging to nineteen different genera, and, when the difficulties in the way of such work are properly appreciated, nothing but admiration can be expressed for the patience, perseverance and thoroughness evidenced in every page of his work. It is monographic in its nature, considering in detail the structure, histology and development of the coral polyps as a group, and concluding with full descriptions of the special morphology of the various forms studied.

Dr. Duerden gives good reason for believing that all corals are fundamentally hexamerous, the corallum septa making their appearance symmetrically in embryos already provided with the six pairs of primary mesenteries. In some species the hexamerism becomes much obscured in later stages, while in others it is more or less distinctly preserved; and it has been possible to correlate these differences with the mode of non-sexual reproduction followed by the species. Two principal methods of non-sexual reproduction are recognizable, namely, gemmation and fission. In the former method the mesenteries of the new individual are formed *de novo* and repeat the embryological development, and consequently the hexamerism of those of the parent, while in the latter method half the mesenteries of the parent pass directly to each descendant whose growth processes are limited to an attempt to reproduce the lacking parts, a second fission frequently supervening before the attempt is carried to completion. In the polyps produced by gemmation the mesenteries present the usual hexamerous arrangement, two pairs of directives and at least four additional pairs arranged symmetrically to the